International institutional support for the use of human excreta as biofertilizers and the necessary adaptations in the Brazilian legislation

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Highlights:

- Ecological sanitation enables recycling nutrients from human excreta, producing biological fertilizers as an alternative to chemical fertilizers.
- Brazilian legislation on sewage sludge use and research can support regulating the safe use of human excreta as biofertilizers.
- Existing Brazilian laws can be refined to support the implementation of using human excreta-derived biofertilizers in organic agriculture.

Keywords: Ecological Sanitation, Biofertilizer, Legislation, Organic Agriculture, Brazil.

INTRODUCTION

Sanitation systems must adapt to local realities, as there is no single solution for all environments and realities, so different modes must be adopted for each environment. One of them is ecological sanitation, which focuses on the recovery of resources, allowing a connection between two areas to solve them (JÖNSSON and VINNERÅS, 2013). These two areas are linked to two Sustainable Development Goals (SDGs), number 2: Zero Hunger and number 6: Clean Water and Sanitation (UN, 2015). Ecological sanitation offers the correct excreta disposal and allows the recycling of nutrients to use treated human excreta in agriculture (ESREY et al., 1998). One of its technologies is the diverting dry toilets, which favors recycling because segregating the excreta fractions at the source enables the production of biological fertilizers from human feces and urine (MAGRI, 2013). These inputs can replace chemical fertilizers, supporting the transition from dominant to alternative food systems and empowering farmers by breaking the monopoly of large companies in conventional agriculture.

Brazil's legal use of sanitation by-products is still limited to sludge from sewage plants or biosolids from the same process. While internationally, there are already documents that provide for this use in a detailed, broad, and technical way. Thus, this study analyzes some of these international documents that address the practice by observing the techniques, the limits of health security, the actors, their functions, and their steps. Therefore, this information is compared with Brazilian legislation that provides for recycling sanitation by-products, suggesting how to adapt these laws to support and regulate biofertilizers from human excreta in organic agriculture. In addition, the regulations that provide for the production of bio inputs and organic and family agriculture are also observed.

METHODOLOGY

The methodology consists of a literature review of international documents compared to some Brazilian laws, with the purpose of a propositional analysis for Brazil. The international texts analyzed are the Swedish Environmental Code and the World Health Organization Guidelines for the Safe Use of Wastewater, Excreta and Greywater" volume IV (WHO, 2006), indicated by EcoSanRes studies (KVARNSTRÖM et al., 2006; SCHÖNNING and STENSTRÖM, 2004). Such documents are compared with Brazilian legislation that supports recycling sludge and biosolids from sanitation systems (CONAMA/2006; CONAMA/2020). To complement this, the provisions necessary to regularize bio-input producers and the obligations and permissions for organic agriculture are analyzed (BRASIL, 2003). These analyses briefly discuss which elements of these documents could compose possible Brazilian legislation regulating the use of bio-inputs from human excreta in agriculture.

RESULTS AND CONCLUSIONS

Although the documents of the EcoSanRes group indicate the Swedish Environmental Code as a principle for using human excreta as fertilizers, it doesn't mention them specifically, but rather the recovery of resources. This occurs by promoting sustainable development, which ensures health and sustainability for present and future generations. It indicates that reuse and recycling should be guaranteed, as well as material and energy management, encouraged by establishing natural cycles (SWEDEN, 1998). On the other hand, the WHO guide shows all the necessary aspects for implementing the treatment and use of human excreta in agriculture, showing the importance of its health security and how to achieve it through appropriate treatment methods (WHO, 2006). In addition, according to Magri (2013), the treatment of feces with additives made of calcium carbonate (e.g., oyster shells or calcarium) and an alkalizing medium, such as ashes, with urea, allowed a significant reduction of pathogens, fitting it into the reuse standards for sludge reuse from CONAMA/2006 CONAMA/2020, USEPA 530 and ADAS UK 1263/1989.

Brazil doesn't have legislative documents on the use of feces and urine in agriculture nor about the recycling of nutrients from sludge from sewage treatment plants and biosolids. Resolution Nº 375 of 2006 defines criteria and procedures for the agricultural use of sludge, aiming at benefits and avoiding risks to public health and the environment (BRASIL, 2006). These risks are avoided by establishing sanitary characteristics of this sludge. This law was repealed by Resolution Nº 498 of 2020, which now deals with biosolids and classifies them by pathogenic levels, heavy metals, which crops and areas can receive them, application rate, and harvest interval (BRASIL, 2020). This information on the concentration of pathogens can also be supported by the Quantitative Microbial Risk Assessment (QMRA), which aims to develop knowledge about spreading and controlling infectious diseases and is also present in the WHO document. This quantification is important because biofertilizers from human excreta must be well controlled to reduce the risk of contamination during their use or by ingesting food grown with them.

Regarding the inspection and supervision of the production and trade of fertilizers, correctives, inoculants, or biofertilizers intended for agriculture, there is Decree Nº 4.954 of 2004. This document presents important aspects of regulating bio-input production from human excreta (BRASIL, 2004). Also, in 2020, the National Bio-input Program was instituted by Decree Nº 10.375 to enhance

development projects, prioritizing small and medium-sized producers, where biofertilizers from human excreta could fit easily (BRASIL, 2020). In addition, to use these bio-inputs as a tool for the transition to an organic production system, they must be regulated as organic fertilizers that optimize natural resources, aiming at economic and ecological sustainability with a biological method as opposed to the synthetic one, as provided for in law Nº 10.831 of 2003 (BRASIL, 2003).

Considering that the Swedish Environmental Code doesn't have details on biofertilizers from human excreta, but this technique is used in the country, Brazilian legislation only needs some refinements from the use of sewage sludge to human excreta so that it can be implemented safely and with legislative support. Such points involve this product's correct collection, treatment, transport, and storage. These steps and characterizations are set out in the WHO guide, which can serve as a basis for adapting the already robust Brazilian legislation.

Another support for this technology is research in this area, which has been increasing since 1998, as evidenced by the SIDA Ecological Sanitation Report (ESREY, 1998). Then, in Brazil, the information about it was improved with studies concerning the characterization of human excreta to evaluate its reuse potential, treatment methods, and use aspects, like agronomic efficiency and microbiological behavior (REBOUÇAS, 2010; BOTTO, 2013; MAGRI, 2013; CARLON, 2021). Thus, based on the health risks arising from QMRA, legislation for sewage sludge, and research, it is possible to establish this safe and supported use in Brazil.

Finally, these interpretations can compose the construction of a proposition for a legislative document that regulates the production, use, and commercialization of bio-inputs from human excreta recovered from sanitation systems, which secrete feces and urine at the source. Resolution N° 375/2006, which provides for the use of sludge in agriculture, can serve as a basis and be adapted for excreta. Resolution N° 498/2020 would allow adding new parameters for evaluating the concentration of pathogens and other substances. Decree N° 4.954/2004 can serve as a basis for classifying these materials as organic fertilizer, ternary fertilizer, or biofertilizer. Also, to strengthen the production of bio-inputs with new technologies, which help in more sustainable and agroecological production, the existence of Decree N° 10.375/2020 that establishes the National Bio-inputs Program and the Strategic Council of the National Bio-inputs Program can be justified.

The WHO document, a specific and complete guide to regulating excreta as fertilizers and is entitled as a basis for elaborating standards in this area, presents the main points to be encompassed. Such as the regulation of technologies for segregation of excreta at source, such as dry toilets with separating vessels (BSVS); the technologies for processing and monitoring this material and especially the steps indicated in the topic of Policy Aspects. In addition, the studies of the EcoSanRes group can contribute to logistical techniques for the segregation, collection, transport, and treatment of segregated excreta (SCHÖNNING and STENSTRÖM, 2004). In addition to being based on examples from several Swedish municipalities that have adopted urine segregation on a larger or smaller scale (KVARNSTRÖM et al., 2006).

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